



**Western University**

**Department of Physics and Astronomy *and the*  
Centre for Advanced Materials and Biomaterials Research (CAMBR)**

**CAMBR Distinguished Lectureship *presently jointly with the*  
PHYSICS & ASTRONOMY Colloquium**

**Date: WEDNESDAY, 6 November 2019**

**Time: 1:30 p.m.**

**Location: Physics & Astronomy Seminar Room 100**

**Dr. Milica Radisic**

Toronto General Research Institute  
University of Toronto

***“Biowire models of healthy and diseased myocardium”***

**ABSTRACT**

Tissue engineering using cardiomyocytes derived from human pluripotent stem cells holds a promise to revolutionize drug discovery, but only if limitations related to cardiac chamber specification and platform versatility can be overcome. I will describe a scalable tissue-cultivation platform that is cell source agnostic and enables drug testing under electrical pacing. The plastic platform enabled on-line non-invasive recording of passive tension, active force, contractile dynamics, and Ca<sup>2+</sup> transients, as well as endpoint assessments of action potentials and conduction velocity. By combining directed cell differentiation with electrical field conditioning, we engineered electrophysiologically distinct atrial and ventricular tissues with chamber-specific drug responses and gene expression. Engineering of heteropolar cardiac tissues containing distinct atrial and ventricular ends is also achieved using this approach and the spatially confined responses to serotonin and ranolazine were validated in these tissues. I will also present modelling of polygenic left ventricular hypertrophy starting from iPSC-cardiomyocytes derived from patients with hypertension and illustrate that electrical conditioning for up to 8 months was necessary to observe the phenotypic and functional changes in comparison to the non-affected controls. In addition, work on the use of patient-derived iPSC to model critical aspects of heritable arrhythmias underlying a sodium channel mutation, SCN5a R222Q will be presented. Relying on these advances, I will describe our efforts to develop the next generation of miniaturized heart tissue models situated in an inert plastic platform similar to a 96-well plate, compatible with microscopy and high-content screening. New 3D printing and multimaterial processing methods are used to scale up and automate manufacturing.

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***COFFEE + cookies will be available in the Atrium, 2nd floor, at 1:15 p.m.***